

ANNEX 1  
BETWEEN  
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
LANGLEY RESEARCH CENTER  
AND  
UNIVERSITY OF NORTH DAKOTA  
UNDER  
SPACE ACT UMBRELLA AGREEMENT SAA1-32507  
FOR  
INVESTIGATION OF NOVEL WEARE-RESISTANT MATERIALS FOR SPACE  
APPLICATIONS

ARTICLE 1. PURPOSE

This Annex shall be for the purpose of collaboration with the University of North Dakota (UND) and NASA Langley Research Center (LaRC), this work will evaluate the feasibility of additive manufacturing of wear-resistant materials for impact-resistant, high wear components tolerant of temperature extremes for space exploration vehicles. The proposed activity seeks to apply an additive manufacturing process at LaRC to produce wear-resistant material powders, such as metal aluminum boride (MAB), uniquely produced by UND. The specific tasks of this proposed effort include UND providing materials, LaRC assessing and identifying parameters needed to effectively produce parts by additive manufacturing, LaRC producing test articles using additive manufacturing capabilities and joint characterization of material and structural properties of the test articles by UND and LaRC.

The legal authority for this Annex, consistent with the Umbrella Agreement, is in accordance with the National Aeronautics and Space Act (51 U.S.C. § 20113(e)).

ARTICLE 2. RESPONSIBILITIES

A. NASA LaRC will use reasonable efforts to:

1. Receive starting materials from UND
2. Assess and identify parameters needed to effectively produce parts from materials shared by UND using Laser Bed Powder Deposition (LBDP) and other processing techniques as needed
3. Produce test articles using LBDP
4. Provide support and guidance and perform testing and characterization of test articles
5. Ship material test articles to UND
6. Host UND visitors for tour of LaRC and student internships as available
7. Provide support and input in preparing peer-review journal article and conference presentations related to this work

B. Partner will use reasonable efforts to:

1. Process and characterize starting materials
2. Provide starting materials for processing at NASA LaRC
3. Receive materials test articles from NASA LaRC
4. Perform testing and characterization of test articles
5. Host NASA visitors for tour of UND as available
6. Provide UND student candidate(s) for internship pending internship availability
7. Provide support and input in preparing peer-review journal article and conference presentations related to this work

### ARTICLE 3. SCHEDULE AND MILESTONES

The planned major milestones for the activities for this Annex defined in the "Responsibilities" Article are as follows:

1. UND will process, characterize and share no more than 10 material samples to NASA LaRC	Within 6 months of execution of Agreement
2. NASA LaRC identify parameters to process UND materials	Within 2 months of previous milestone
3. NASA LaRC fabricates test articles using UND materials	Within 6 months of previous milestone
4. NASA LaRC and UND determine characterization plan	Within 2 months of previous milestone
5. NASA LaRC performs any preliminary characterization deemed necessary by both parties and share results	Within 6 months of previous milestone
6. NASA LaRC transfers test articles to UND for further characterization and testing	Within 1 months of previous milestone
7. UND performs characterization deemed necessary by both parties and share results	Within 6 months of previous milestone
8. NASA LaRC work with UND to potentially generate presentations and publications from results	Within 6 months of previous milestone

### ARTICLE 4. FINANCIAL OBLIGATIONS

There will be no transfer of funds between the Parties under this Agreement and each Party will fund its own participation. All activities under or pursuant to this Agreement are subject to the availability of funds, and no provision of this Agreement shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, (31 U.S.C. § 1341).

## ARTICLE 5. INTELLECTUAL PROPERTY RIGHTS - DATA RIGHTS

A. Data produced under this Annex which is subject to paragraph C. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement will be protected for the period of one year.

B. Under paragraph H. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement, Disclosing Party provides the following Data to Receiving Party. The lists below may not be comprehensive, are subject to change, and do not supersede any restrictive notice on the Data provided.

1. Background Data:

The Disclosing Party's Background Data, if any, will be identified in a separate technical document.

2. Third Party Proprietary Data:

The Disclosing Party's Third Party Proprietary Data, if any, will be identified in a separate technical document.

3. Controlled Government Data:

The Disclosing Party's Controlled Government Data, if any, will be identified in a separate technical document.

4. The following software and related Data will be provided to Partner under a separate Software Usage Agreement:

None

## ARTICLE 6. TERM OF ANNEX

This Annex becomes effective upon the date of the last signature below ("Effective Date") and shall remain in effect until the completion of all obligations of both Parties hereto, or three years from the Effective Date, whichever comes first, unless such term exceeds the duration of the Umbrella Agreement. The term of this Annex shall not exceed the term of the Umbrella Agreement. The Annex automatically expires upon the expiration of the Umbrella Agreement.

## ARTICLE 7. RIGHT TO TERMINATE

Either Party may unilaterally terminate this Annex by providing thirty (30) calendar days written notice to the other Party.

## ARTICLE 8. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Annex.

Management Points of Contact	
<u>NASA Langley Research Center</u>	<u>UNIVERSITY OF NORTH DAKOTA</u>

<p>Sherri Yokum Center's Agreements Manager Mail Stop: 264 Langley Research Center Hampton, VA 23681 Phone: 757-864-3739 sherri.l.yokum@nasa.gov</p>	<p>John Mihelich Interim Vice President for Research &amp; Economic Development, VP Research 264 Centennial Drive Stop 7144 Grand Forks, ND 58202-7144 Phone: 701-777-7589 john.mihelich@UND.edu</p>
Technical Points of Contact	
<p><u>NASA Langley Research Center</u> Valarie Wiesner Research Materials Engineer Mail Suite: 226 Langley Research Center Hampton, VA 23681 Phone: 757-864-4384 valarie.l.wiesner@nasa.gov</p>	<p><u>UNIVERSITY OF NORTH DAKOTA</u> Surojit Gupta Associate Professor, University of North Dakota 264 Centennial Drive Stop 7144 Grand Forks, ND 58202-7144 Phone: 701-777-1632 surojit.gupta@und.edu</p>

#### ARTICLE 9. MODIFICATIONS

Any modification to this Annex shall be executed, in writing, and signed by an authorized representative of NASA and the Partner. Modification of an Annex does not modify the terms of the Umbrella Agreement.

#### ARTICLE 10. SIGNATORY AUTHORITY

The signatories to this Annex covenant and warrant that they have authority to execute this Annex. By signing below, the undersigned agrees to the above terms and conditions.

NATIONAL AERONAUTICS AND  
SPACE ADMINISTRATION  
LANGLEY RESEARCH CENTER

UNIVERSITY OF NORTH DAKOTA

BY: \_\_\_\_\_  
David Dress  
Director, Space Technology and  
Exploration Directorate

BY: \_\_\_\_\_  
Surojit Gupta  
Associate Professor

DATE: \_\_\_\_\_

DATE: \_\_\_\_\_